5.0

TRANSMISSION FACILITIES

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APPENDIX [in Volume II]

Appendix F Initial Load Flow Study

5.0 TRANSMISSION FACILITIES

This section describes the project's transmission facilities proposed to interconnect the power plant with the PG&E transmission system located directly adjacent to the proposed Colusa Power Plant (CPP). Final design will be by PG&E, who will own and operate the transmission facilities.

5.1 INTERCONNECTION TO TRANSMISSION GRID

Generation from the CPP will be delivered to PG&E's high voltage transmission grid. The CPP will be interconnected with PG&E's transmission grid by looping the four north-south 230 kV Cottonwood to Vaca-Dixon lines into the CPP switchyard. The corridor containing the existing Cottonwood to Vaca-Dixon lines is located approximately 2,000 feet east of the CPP site.

A conceptual diagram showing the proposed interconnection is shown on Figure 5.1-1. This diagram shows the four existing 230 kV circuits that begin at Cottonwood. One of the circuits is routed directly to Vaca-Dixon. The other three are connected to intermediate substations as shown on Figure 5.1-1. As noted, all four circuits are within the transmission corridor adjacent to the project site.

To interconnect the CPP, each of the four circuits will be looped from the transmission corridor into the CPP switchyard and then back to the transmission corridor as shown on Figure 5.1-1. Each of these loop lines will be approximately 2,000 feet in length. A total of 8 new circuits will be constructed between the transmission corridor and the new switchyard. Two circuits are carried on each tower line, so there will be four tower lines between the transmission corridor, as shown on Figure 3.3-1, Site Plan.

The eastern end of the transmission line interconnection, where it connects to the existing transmission lines, passes through an area that contains a few diffuse vernal pools. Transmission line towers, if required, will be sited to completely avoid direct impacts to jurisdictional wetlands, and will be located far enough from these areas so that there is no temporary disturbance during construction. Any vehicular access that may be required for regular maintenance will occur between June 15 and October 1, when the wetlands are dry. Vehicles used in this area will be in good condition, and will not leak oil, gas, or other fluids.

Reliant has filed an application for interconnection of the plant with PG&E. Reliant has also prepared an initial load flow study which has been included in Appendix F. Initial results of this study show that interconnection of the CPP reduces the real and reactive system losses, thus improving area transmission voltage levels and the reactive margin. The new generation also eliminates the need for load shedding of particular multiple contingency conditions.

5.2 INTERCONNECTION CONFIGURATION

5.2.1 Structures

Double-circuit single-shaft steel transmission towers will be used for both the looping of PG&E's 230 kV lines into the plant switchyard and for the connections from the generator step-up transformers to the plant switchyard.

Figure 5.2-1 shows a double-circuit single-shaft steel tower structure with davit arms supporting suspension insulators, to which the conductors are attached. The structure height above grade is 100 feet but may vary depending on configuration of the site terrain.

5.2.2 Conductors

The selection of conductor for looping PG&E's 230 kV lines into the plant switchyard will be based on matching the rating of the existing circuits with some additional capacity to accommodate possible future use of these lines. The conductor that will meet these requirements is 954 MCM AAL and 954 MCM ACSR. This conductor is expected to carry the full current output of the power plant, and is proposed for connecting the generator collector bus and switchyard.

5.2.3 Foundations

Foundations for the transmission line structures consist of single concrete piers reinforced as necessary to withstand design loads. These are formed by augering a hole of appropriate diameter and depth, placement of a cage of reinforcing steel in the augered hole, and filling the hole with high-strength concrete to the appropriate elevation. Single circuit tower structures may be direct-buried rather than installed on foundations.

5.3 ELECTROMAGNETIC FIELD/RADIO-TELEVISION INTERFERENCE

The electrical transmission interconnection and other electrical devices that will be constructed as part of the CPP emit electromagnetic fields (EMF) when in operation. These fields are typically measured near ground level where they are encountered by people. In addition, operation of electrical transmission lines can cause interference with radio and TV signal reception.

As described in the previous section, interconnection of the CPP to the PG&E transmission system will require looping the existing Cottonwood to Vaca-Dixon transmission lines into the new Colusa Power Plant switching station. These additions to the transmission system will not be in a fenced area and thus have uncontrolled access.

Interconnection of the CPP into the PG&E transmission system will also modify the power flows on the PG&E Cottonwood to Vaca-Dixon transmission circuits. Since EMF is related to power flow, interconnection of the CPP will modify the EMF generated by the existing transmission lines.

Finally, EMF fields, to the extent they occur, could impact receptors on the properties adjacent to the proposed project. In addition, radio and TV interference could occur at nearby residences.

As shown on Figure 3.3-1, Site Plan, the plant site will be enclosed by a security fence. Site access will be limited to station workers, incidental construction and maintenance personnel, other company personnel, regulatory inspectors, and approved guests. Since access is not available to the general public, general public exposure to EMF is not expected to occur from the CPP facility or switchyard itself.

Calculation of electric and magnetic field strength was performed for an area covering one square mile. The area encloses the entire project site, including the new transmission line requirements and sections of the existing PG&E lines that were looped into the proposed site. The analysis was performed using the following assumptions:

Double Circuits – 3 Phase vertical cross-phased configurations
Transmission phasing and loading as shown in Table 5.3-1
Minimum Conductor Height – 45 feet above ground
Horizontal spacing between conductors on tower centerline – 14.5 feet
Vertical Spacing between conductor phases – 16.5 feet

The line loading for each circuit is shown in Table 5.3-1.

It has been determined that the nearest TV or radio receptor is located approximately 1.7 miles from the proposed site. Radio and television interference is therefore negligible due to the distance between the proposed site and nearest receptor.

These results of the EMF analysis are shown in Table 5.3-2, and indicate that the maximum magnetic fields seen after the addition of the Reliant Colusa project are located where the existing four 230 kV lines are cut and looped into the CPP switchyard. Table 5.3-2 shows magnetic and electric fields generated by the existing PG&E transmission system and the interconnection to the CPP. It shows the fields generated under existing maximum line loading and after addition of the CPP. It also shows the field strengths at a point 250 feet away from the lines.

The highest value calculated was 85.0 milligauss (mG) at the point of intersection of the PG&E transmission lines and the new lines looping into the new CPP switchyard. The corresponding maximum electric field at this location was 0.88 V/m. As one moves away from this location, both fields degrade rapidly. For example, at a distance of 250 feet from the point of maximum field strength, the magnetic field is reduced to 3.8 mG.

The results show how all of the fields degrade rapidly with distance from the lines. Since the nearest permanent residence is approximately 1.7 miles from the proposed project, magnetic and electric fields generated by the transmission lines are essentially negligible both before and after development of the CPP.

5.4 CONSTRUCTION

Construction of the interconnection between the existing Cottonwood to Vaca-Dixon transmission corridor at the CPP will be undertaken by PG&E. Construction will be scheduled to occur after the CPP switchyard has been completed. This will allow each transmission circuit to be placed back in service immediately after it is interconnected to the CPP switchyard. The construction of the loop lines will be phased to minimize coincident outages of parallel circuits.

Construction of the loop lines is estimated to include disturbance at 24 locations where excavation for tower locations will occur and towers will be installed. Wheeled vehicles for transportation of conductor spools, and line pulling and tensioning equipment will traverse the transmission line construction area.

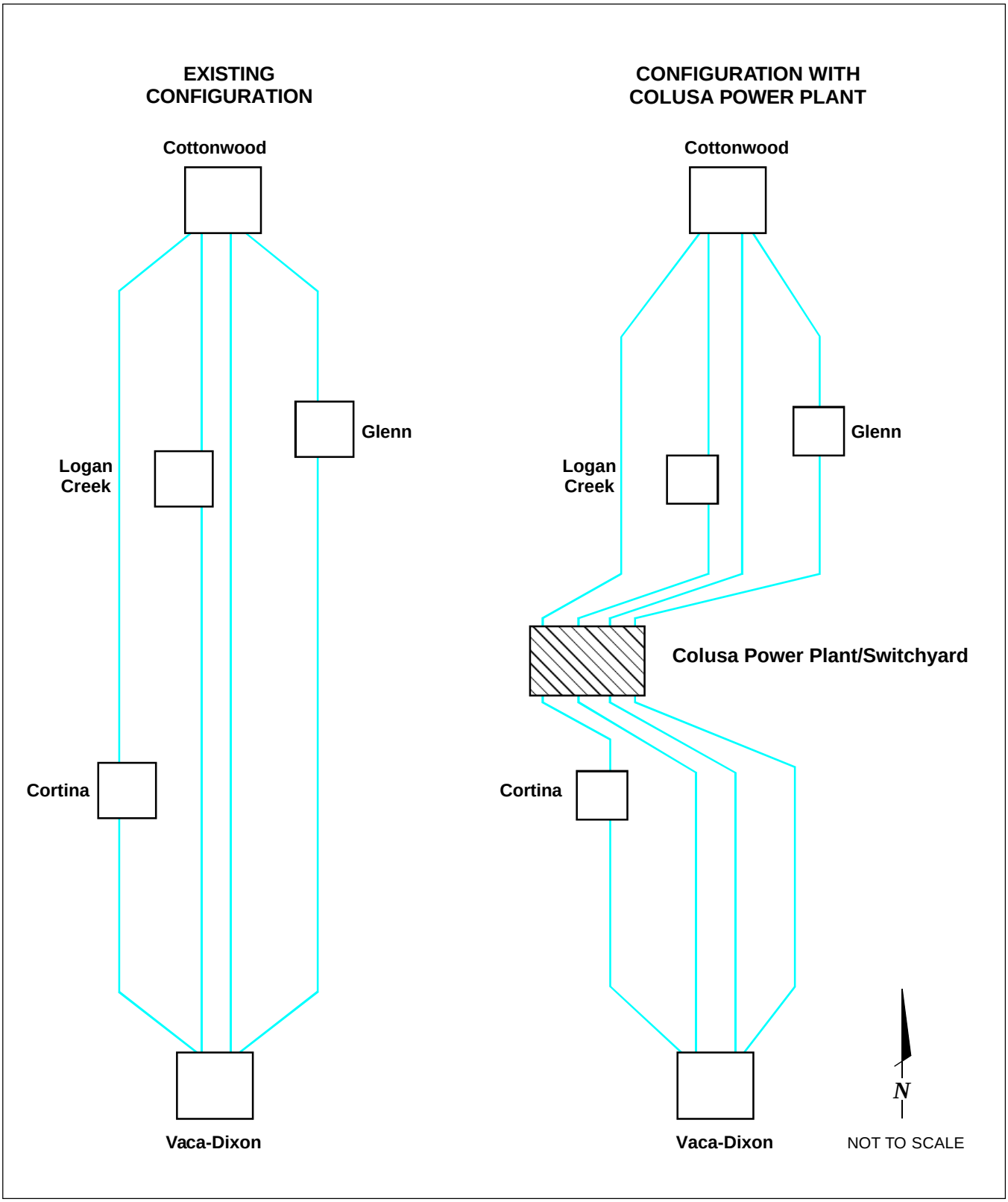
Equipment laydown for transmission construction will use a portion of the cleared equipment laydown area for the power plant.

Table 5.3-1
Transmission Circuit Line Loading

Transmission Lines on Same Tower	Phasing Sequence (Top to Bottom)	Line Amps
Cottonwood-Reliant Colusa No. 2 230 kV	ABC	213.8
Logan Creek-Reliant Colusa 230 kV	CBA	148.4
Cottonwood-Reliant Colusa No. 1 230 kV	ABC	208.6
Glenn-Reliant Colusa 230 kV	CBA	79.2
Reliant Colusa-Cortina 230 kV	ABC	743.0
Reliant Colusa-Vaca Dixon No. 2 230 kV	CBA	470.3
Reliant Colusa-Vaca Dixon No. 1 230 kV	ABC	454.7
Reliant Colusa-Vaca Dixon No. 3 230 kV	CBA	454.7

Table 5.3-2
EMF and Electric Fields

		PG&E Transmission Lines								CPP Interconnect				Maximum Value	
		Circuits Before		North After		Circuits Before		South After		Before		After			
	Units	Max	250¢	Max	250¢	Max	250¢	Max	250¢	Max	250¢	Max	250¢	Max	250¢
Magnetic Field	mG	15.0	1.94	11.2	1.3	15.0	1.94	43.9	2.6	NA	NA	39.9	4.46	85.0	3.8
Electric Field	V/m	0.9	0.034	0.9	0.034	0.9	0.034	0.9	0.034	–	–	0.88	0.20		



LEGEND

- Existing Substation
- New Colusa Power Plant Switchyard
- 230 kV Transmission Circuit

INTERCONNECTION TO THE COTTONWOOD TO VACA-DIXON 230 kV TRANSMISSION SYSTEM

Colusa Power Plant
Reliant Energy
43-00066841.00 Colusa County, California

URS

FIGURE 5.1-1

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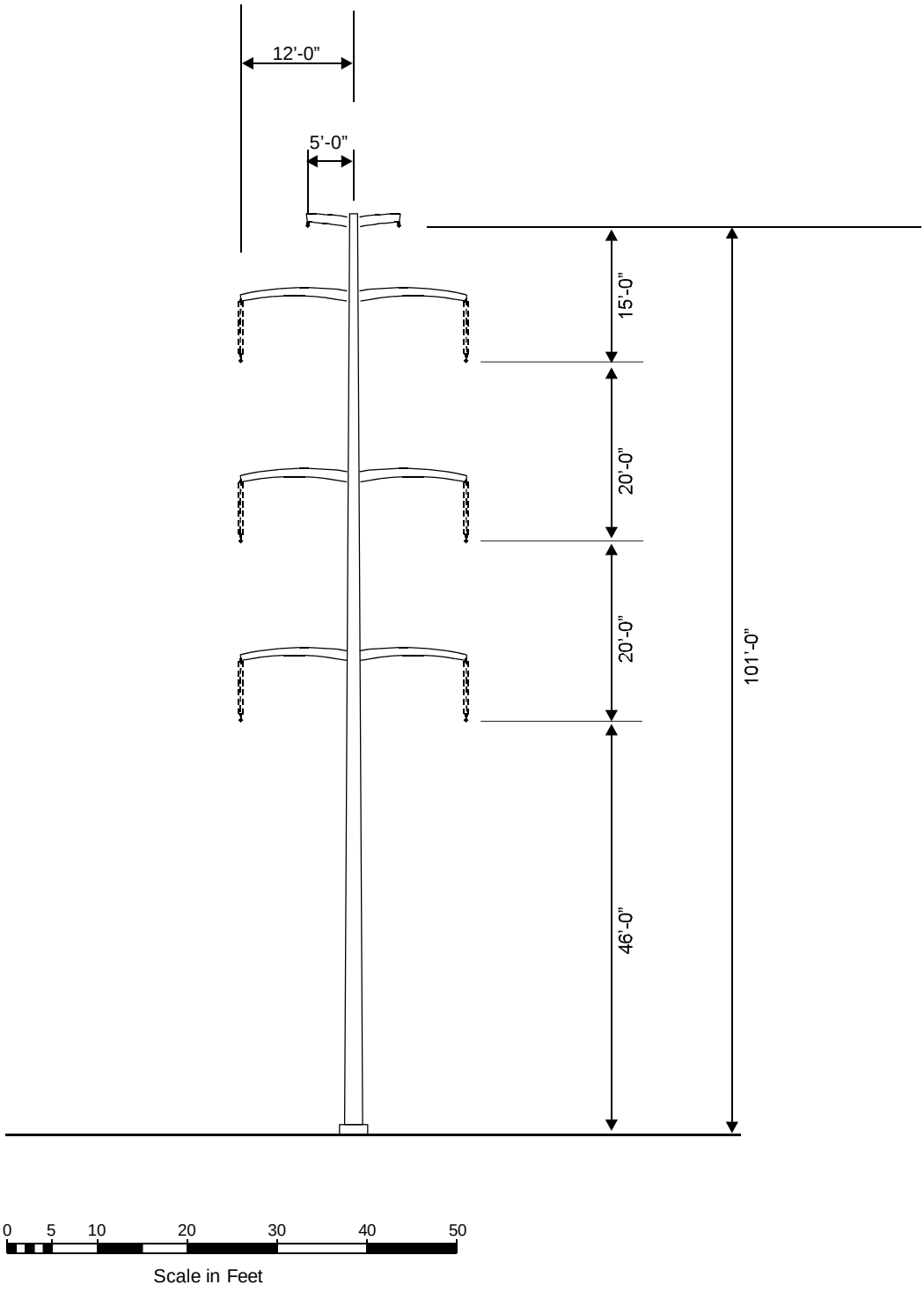

TRANSMISSION LINE
DOUBLE-CIRCUIT SUSPENSION POLE

Colusa Power Plant
Reliant Energy
43-00066841.00 Colusa County, California

URS

FIGURE 5.2-1

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